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EARTHWORMS AS PLANTERS OF TREES

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THAT squirrels aid the forester by burying nuts, some of which may be left to germinate and so start new trees, has long been known; but that common earthworms play a like part in the drama of the woods has not been suspected. The following observations, however, show that the earthworm may be of use in aiding the germination of at least one important kind of tree and raise the question whether they do not do the same for some other trees as well as for many smaller plants.

The earthworm assists in planting by bringing the seeds into close contact with the soil, even burying them. Here, as in the case of the squirrel, the object sought by the animal is not the germination of the seed. The squirrel is following a strong food instinct in hiding away nuts, many of which it will find again and eat; the earthworm is also obeying a very strong instinct, which is, however, only in part a food instinct. This instinct expresses itself in the somewhat mysterious habit the earthworm has of plugging up its burrows.

As is well known, some of our common kinds of earthworms make holes in the ground and inhabit them for long as places of protection from dryness and from various enemies. In the night time, however, these earthworms may leave their burrows more or less completely, to seek on the surface of the ground various objects to be used as food, and to associate with other earthworms. They then seize and eat both live and dead vegetable matter, and soft animal matter when available; and they also drag back to or into their burrows both edible and inedible objects. At times the materials collected at the mouths of earthworms' burrows plug them up most effectively, so as to suggest that the chief purpose of this activity is to close the opening of the burrow after the worm has gone in. Thus one may frequently see tufts of pine needles, of dead brown or of fresh green deciduous leaves, or of other light objects that may have been upon the surface, sticking up here and there over the ground, each tuft so tightly and completely filling a burrow that one might at first suppose that children at play had deftly thrust leaves into all the earthworms' burrows.

It was this strong instinct to plug up its burrows which Darwin seized upon as a means of enquiry into the mental powers of the earthworm. Scattering triangles of paper over the ground he judged from the way in which these triangles were used by the worm in plugging its burrows that it distinguished between angles of different acuteness and probably exercised something akin to reasoning. In his classic work on the earthworm Darwin does not refer to the possible collection of seeds, though he discusses the plugging instinct at considerable length. He says,—"Worms seize leaves and other objects not only to serve as food, but for plugging up the mouths of their burrows; and this is one of their strongest instincts. Leaves and petioles of many kinds, some flower peduncles, often decayed twigs of trees, bits of paper, feathers, tufts of wool, and horse hairs are dragged into their burrows for this purpose....They often, or generally, fill in the interstices between the drawn-in leaves with moist, viscid earth ejected from their bodies; and thus the mouths of their burrows are securely plugged....When worms cannot obtain leaves, petioles, sticks, etc., with which to plug up the mouths of their burrows, they often protect them by little heaps of stones; and such heaps of smooth, rounded pebbles may frequently be seen on gravel walks...." Darwin was inclined to think that one advantage gained by the earthworms in plugging up their burrows lay in the protection gained from cold night air, from animal enemies, and less probably from rain.

Whatever the utility of this instinct, it is carried out with so great a variety of objects, that it was not surprising to find earthworms plugging their burrows with the dry, flat fruits of the maple tree. On May 30th the ground under several large silver maple trees in Druid Hill Park was thickly sprinkled with the yellow key-fruit, or samaras, that had fallen from these trees, and it was quite noticeable that in many places these fruits were gathered together in little heaps. Each collection of seeds contained form twelve to fifty, some lying loose, others more or less buried in the earth. One of the larger heaps when lifted up filled a hand nearly full.

In some places the heaps were not more than a foot apart, but elsewhere they were more sparsely scattered. When any heap was dug up it was found to be a mass of samaras, bound together with earth and some few fibers, probably dead grass.

The ground about some of the collections of maple tree seeds was markedly free from seeds and clean, so that it seemed as if the worms had reached out of their burrows to nearly their full length of eight or nine inches and dragged back all the seeds they could find in a circular area of which their stretched out bodies made the radius. All this was much more evident in the areas close to the tree trunks where there was little or no grass, while far out from the tree trunks, where the grass was thick, the heaps of seeds were smaller and not so evident, both because of the grass and because there was a more uniform distribution of seeds with a less perfect cleaning up of the neighborhood of each heap.

The earthworms' holes were completely closed by the samaras and earth. When about an inch deep of earth and seeds had been removed the open burrow was seen as a clear hole about as big as a pencil. An imaginary section down through a heap of seeds would show a low cone made of seeds imbedded in earth, covered with some dry, free seeds on the surface, the whole rising an inch or more above the normal surface of the ground and of the upper end of the earthworms' burrow.

It was not determined what species of earthworm made the collections of maple seeds. The few small red earthworms found in some cases lying in amongst the seeds and moist earth that plugged the burrows, probably had nothing to do with the making of the burrows or with the collecting of seeds, though they may have profited by the moist vegetable food and other conditions found in these heaps.

The samaras were for the most part buried so that the flat wing was down and the thick part, containing the seed, uppermost; in fact in many cases it was only the wing that was in the ground. However, in some cases the seed was down and the wing uppermost. Apparently the earthworm had as a rule taken hold of the samara by the flat wing and dragged it with this part foremost. While the samaras lying loose upon the ground were all intact and not injured many of those inside the heaps were frayed and frazzled so that the shorter side of the wing often looked like a comb.

Probably the worms had macerated and eaten off the leaf-like part of the samaras but left the seed end uninjured.

In every collection of seeds some three or four, or more, had sprouted, while outside these collections none of the seeds lying over the ground were found to have sprouted. Most of the sprouting seeds showed merely a short radicle and in the many cases in which the seed end of the samara was above ground the radicle was growing down to enter the earth. Some of the seeds that were well buried had advanced farther; in one case the young stem was three inches long and bore a small expanding plumule.

Though so many young trees were thus started by the aid of earthworms in a situation in which the seeds did not sprout at all unless thus brought into connection with the necessary moisture, few of these seedlings made much further progress, as the conditions were too unfavorable. But even after a long dry hot period, on June 27th, some dozens of young trees were found scattered over the bare ground under the more densely shading parts of the mother trees, where they were not destroyed by the lawn mowers as completely as were any that started to grow in the grass. These little trees were three to four inches in height; the cotyledons were shrivelled while two or three pairs of leaves of maple shape were now in evidence. Some of the trees were in groups with remnants of old decayed samaras about them to indicate the former mound of earth, since washed away. The many trees standing isolated were deeply implanted in the ground and probably stood where earthworms' mounds had been. A photograph taken then shows six or seven little trees of different sizes all rising up close together from one old heap of samaras. Even these favored few did not survive the increasingly adverse conditions, for on August first, when the hard dry ground under the parent trees was marked by radiating, branching streaks of brown grass that had died over their old superficial roots, all the seedling trees had disappeared.

The failure of this particular planting, under such conditions, does not, of course, invalidate the contention that in nature the earthworms may play quite an important part in forestry. They probably more than amend, by planting trees, the damage with which they are credited through destroying seedlings in gardens.

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